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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* DANIEL P. JOHNSON

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Appeal 2007-3877  
Application 10/032,682  
Technology Center 3600

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Decided: May 27, 2008

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Before ALLEN R. MACDONALD, DAVID B. WALKER,  
and JOSEPH A. FISCHETTI, *Administrative Patent Judges*.

Filed by MACDONALD, *Administrative Patent Judge*; concurring opinion  
by WALKER, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF CASE

*Introduction*

Appellant appeals under 35 U.S.C. § 134 from a final rejection of  
claims 1-20. We have jurisdiction under 35 U.S.C. § 6(b).

According to Appellant, the invention is a method and medium for solving an operations problem. The operations problem includes both planning and scheduling problems. (Spec. ¶ [0006].)

*Exemplary Claim(s)*

Exemplary independent claims 1 and 6 under appeal read as follows:

1. A method of solving an operations problem, the operations problem comprising a scheduling problem in a particular business operation, comprising:

receiving variables, relationships, and constraints relating to the scheduling problem;

forming a set of non-convex quadratic equations based on the variables, relationships, and constraints;

solving the set of non-convex quadratic equations by applying a bound propagation process, a local linear bounding process, a local linearization process, and a global subdivision search; and

determining whether a solution to the scheduling problem is optimal, feasible, or infeasible.

6. machine-accessible medium having associated content capable of directing the machine to perform a method of solving a set of non-convex quadratic equations relating to a scheduling problem in a particular business operation, the method comprising:

selecting a region bounding all variables relating to the scheduling problem;

applying a bound propagation process to the region to refine the bounds and improve linearization;

applying a local linear bounding process to the region to determine feasibility and to find approximately feasible solutions to the scheduling problem;

applying a local linearization process to the region to determine feasibility and local optimality;

upon finding an optimal global solution to the scheduling problem, providing the optimal global solution and information indicating optimality;

upon finding a feasible global solution to the scheduling problem, providing the feasible global solution to the scheduling problem and information indicating feasibility;

upon determining local infeasibility, eliminating the region from consideration;

upon determining global infeasibility, providing information indicating infeasibility; and

upon not finding a solution to the scheduling problem, applying a global subdivision search to the region to produce two or more regions and iteratively applying the bound propagation, local linear bounding, and local linearization processes to each of the two or more regions, until determining the solution to the scheduling problem is optimal, feasible, or infeasible.

*Prior Art*

The prior art relied upon by the Examiner in rejecting the claims on appeal is:

Hillier et al., *Introduction to Operations Research (6th ed)*, McGraw-Hill, Inc., pages ix-xiii, 8-80, 558-607, and 986-998, © 1995, (hereinafter “Hillier”).

*Rejections*

The Examiner rejected claims 1-20 under 35 U.S.C. § 101 as failing to recite statutory subject matter.

The Examiner rejected claims 1-20 under 35 U.S.C. § 112, first paragraph, as not being enabled for the scope of the claims.

The Examiner rejected claims 1-20 under 35 U.S.C. § 112, second paragraph, as being indefinite.

The Examiner rejected claims 1-20 under 35 U.S.C. § 102(b) as being anticipated by Hillier.

*Appellant's Contentions*

(1) Appellant contends that the Examiner erred in rejecting claims 1-20 under 35 U.S.C. § 101 as failing to recite statutory subject matter because the claims recite “a useful, concrete, and tangible result” (App. Br. 10:19).

(2) Appellant contends that the Examiner erred in rejecting claims 1-20 under 35 U.S.C. § 112, first paragraph, as not being enabled for the scope of the claims because the claimed invention can be practiced “without undue experimentation” (App. Br. 12:9).

(3) Appellant contends that the Examiner erred in rejecting claims 1-20 under 35 U.S.C. § 112, second paragraph, as being indefinite because

the Specification states that “the variables may represent qualities, quantities, timing, and the like” and “a person of skill in [the art] would be able to identify the variables that are pertinent to his or her industry” (App. Br. 12:16-19).

(4) Appellant contends that the Examiner erred in rejecting claims 1-20 under 35 U.S.C. § 102(b) as being anticipated by Hillier because the Final Office Action:

(A) fails to identify where in Hillier elements of claim 1 (and similarly claims 6 and 12) are disclosed such as forming non-convex quadratic equations and solving the non-convex quadratic equations by applying a bound propagation process, a local linear bounding process, a local linearization process, and a global subdivision search (App. Br. 13:22-25).

(B) fails to explain where Hillier discloses the element reciting that upon failing to find a solution to the scheduling problem, that a global subdivision search is applied to a bounding region to produce two or more regions, and furthermore that the bound propagation, local linear bounding, and local linearization processes are iteratively applied to each of the two or more regions until it is determined that the solution to the scheduling problem is optimal, feasible, or infeasible, as required by claims 6 and 12 (App. Br. 13:26-14:4).

### *Result*

We affirm.

### ISSUE(S)

Has Appellant established that the Examiner erred in rejecting claims 1-20 under 35 U.S.C. § 101 as failing to recite statutory subject matter.

Has Appellant established that the Examiner erred in rejecting claims 1-20 under 35 U.S.C. § 112, first paragraph, as not being enabled for the scope of the claims.

Has Appellant established that the Examiner erred in rejecting claims 1-20 under 35 U.S.C. § 112, second paragraph, as being indefinite.

Has Appellant established that the Examiner erred in rejecting claims 1-20 under 35 U.S.C. § 102(b) as being anticipated by Hillier.

### FINDINGS OF FACT

The following Findings of Fact (FF) are shown by a preponderance of the evidence.

#### *Appellant's Invention*

1. According to Appellant, the invention is a method and medium for solving an operations problem. The operations problem includes both planning and scheduling problems. (Spec. ¶ [0006].)
2. Further, Appellant indicates that the invention is a method to determine global optimality/feasibility/infeasibility when solving a quadratic system of modeling equations for industrial problems (Abstract 1-2).
3. The method determines whether a solution is optimal, feasible, or infeasible (Spec. ¶ [0006]).
4. The present invention is a solver which solves a set of equations, giving a set of variables and what they are equal to in the solution, if one exists (Spec. ¶ [0009]).

5. The solver can be applied to inventory, suppliers, ordering, customers, and production (Spec. ¶ [0013]).
6. “In addition, the present invention has many other applications.” (Spec. ¶ [0013], last sentence).
7. Figure 2 “represents a rather simple set of equations with 3 variables.” (Spec. ¶ [0014]).
8. A typical set of equations has 10,000 variables, so a typical bounded region would have 10,000 dimensions. (Spec. ¶ [0014]).
9. One aspect of the present invention is a method 300 of solving an operations problem. (Spec. ¶ [0016]).
10. Operations problems comprehend both planning and scheduling problems. For example, problems include maximizing profits, meeting shipments, meeting production schedules, meeting product specification requirements, and other business problems. Operations problems are optimization problems in industries as diverse as banking, education, forestry, petroleum, and trucking. (Spec. ¶ [0016]).
11. The method 300 (Figure 3) comprises receiving variables 302, relationships 304, and constraints 306. (Spec. ¶ [0016]).
12. The variables 302 are things like qualities, quantities, timing, and the like. (Spec. ¶ [0016]).
13. Some examples of constraints 306 in refinery applications are tank limits, product specifications, gasoline octane ratings, operating limits and the like. (Spec. ¶ [0016]).



14. The method 300 comprises forming a set of non-convex quadratic equations 308 based on the variables 302, relationships 304, and constraints 306. (Spec. ¶ [0017]).

15. The method 300 further comprises solving the set of non-convex quadratic equations by applying a bound propagation process, a local linear bounding process, a local linearization process, and a global subdivision search. This is shown in Figure 3 as the solver 310. (Spec. ¶ [0018]).

16. The method 300 further comprises determining whether a solution is optimal, feasible, or infeasible. (Spec. ¶ [0018]).

17. Another aspect of the present invention is a machine-accessible medium having associated content capable of directing the machine to perform a method 400 of solving a set of non-convex quadratic equations. (Spec. ¶ [0023]).

#### PRINCIPLES OF LAW

Appellant has the burden on appeal to the Board to demonstrate error in the Examiner's position. *See In re Kahn*, 441 F.3d 977, 985-86 (Fed. Cir. 2006).

"The Patent and Trademark Office (PTO) must consider all claim limitations when determining patentability of an invention over the prior art." *In re Lowry*, 32 F.3d 1579, 1582 (Fed. Cir. 1994) (citing *In re Gulack*, 703 F.2d 1381, 1385 (Fed. Cir. 1983)). "Claims must be read in view of the specification, of which they are a part." *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995) (en banc). "[T]he PTO gives claims their 'broadest reasonable interpretation.'" *In re Bigio*, 381 F.3d 1320, 1324

(Fed. Cir. 2004) (quoting *In re Hyatt*, 211 F.3d 1367, 1372 (Fed. Cir. 2000)). "Moreover, limitations are not to be read into the claims from the specification." *In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993) (citing *In re Zletz*, 893 F.2d 319, 321 (Fed. Cir. 1989)).

During examination of patent application, a claim is given its broadest reasonable construction consistent with the specification. *In re Prater*, 415 F.2d 1393, 1404-05 (CCPA 1969). As our reviewing court stated in *Phillips v. AWH Corp.*, 415 F.3d 1303, 1315 (Fed. Cir. 2005):

The claims, of course, do not stand alone. Rather, they are part of "a fully integrated written instrument," *Markman*, 52 F.3d at 978, consisting principally of a specification that concludes with the claims. For that reason, claims "must be read in view of the specification, of which they are a part." *Id.* at 979. As we stated in *Vitronics*, the specification "is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term." 90 F.3d at 1582.

Moreover, in prosecution before the Patent Office, claims are given their broadest reasonable construction consistent with the specification. *In re American Academy of Science Tech. Center*, 367 F.3d 1359, 1364 (Fed. Cir. 2004).

The subject matter encompassed by the claims on appeal must be reasonably understood without resort to speculation and conjecture. Note *In re Steele*, 305 F.2d 859, 862 (CCPA 1962) (A prior art rejection cannot be sustained if the hypothetical person of ordinary skill in the art would have to make speculative assumptions concerning the meaning of claim language.); Note also *In re Wilson*, 424 F.2d 1382, 1385 (CCPA 1970).

“The scope of the claims must bear a reasonable correlation to the scope of enablement provided by the specification to persons of ordinary skill in the art.” *In re Fisher*, 57 C.C.P.A. 1099, 427 F.2d 833, 839 (CCPA 1970).

The enablement requirement of § 112 demands that the patent specification enable those skilled in the art to make and use the full scope of the claimed invention without undue experimentation. *Nat’l Recovery Techs., Inc. v. Magnetic Separation Sys., Inc.*, 166 F.3d 1190, 1195 (Fed. Cir. 1999).

The enablement requirement ensures that the public knowledge is enriched by the patent specification to a degree at least commensurate with the scope of the claims. The scope of the claims must be less than or equal to the scope of the enablement. The scope of enablement, in turn, is that which is disclosed in the specification plus the scope of what would be known to one of ordinary skill in the art without undue experimentation. *Nat’l Recovery Techs.*, 166 F.3d 1195-96.

Furthermore, “[w]hether undue experimentation is needed is not a single, simple factual determination, but rather is a conclusion reached by weighing many factual considerations.” *In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1988).

Some of these considerations, commonly referred to as “the Wands factors,” include “(1) the quantity of experimentation necessary, (2) the amount of direction or guidance presented, (3) the presence or absence of working examples, (4) the nature of the invention, (5) the state of the prior art, (6) the relative skill of those in the art, (7) the predictability or

unpredictability of the art, and (8) the breadth of the claims. *Wands*, 858 F.2d at 737.

In *Datamize, LLC v. Plumtree Software, Inc.*, the Federal Circuit considered the claim term "aesthetically pleasing," which the district court had found to be "hopelessly indefinite" in a utility patent claiming a software program. 417 F.3d 1342, 1347 (Fed. Cir. 2005). Affirming the district court, the Federal Circuit stated that "[t]he scope of claim language cannot depend solely on the unrestrained, subjective opinion of a particular individual purportedly practicing the invention.... Some objective standard must be provided in order to allow the public to determine the scope of the claimed invention." *Id.* at 1350.

#### ANALYSIS - 35 U.S.C. § 101

##### *A. Method or Process Claims 1-5 and 12-20*

Appellant argues that the Examiner erred because the claims recite "a useful, concrete, and tangible result" (App. Br. 10:19).

We disagree. Under a broadest reasonable interpretation, Appellant's claims do not recite and thus do not require computer-implementation. The issue is whether Appellant's claims 1-5 and 12-20, which respectively cover a "method of solving an operations problem" and a "process of solving a set of non-convex quadratic equations relating to a scheduling problem" involving no transformation and no process involving the other three statutory categories (machine, manufacture, or composition of matter),<sup>1</sup> are

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<sup>1</sup> "A machine is a concrete thing, consisting of parts, or of certain devices and combination of devices." *Burr v. Duryee*, 68 U.S. 531, 570 (1863). The

patentable subject matter under 35 U.S.C. § 101. So construed, Appellant's claims are unpatentable under section 101 because (1) they do not qualify as a "process" under section 101, as that term has been interpreted by case law, and (2) they seek to patent an abstract idea, and (3) the "useful, concrete, and tangible result" test does not apply here, but the claims nevertheless do not meet that test.

Method and process claims 1-5 and 12-20 differs from traditional process claims in several respects. For example, the claim does not recite any particular way of implementing the steps, nor does it require any machine or apparatus to perform the steps. In addition, the method claim does not recite any electrical, chemical, or mechanical acts or results, which are typical in traditional process claims. Finally, the claim does not call for any physical transformation of an article to a different state or thing, nor does it require any transformation of data or signals. Appellant's claims are not the type of method that the Supreme Court or Federal Circuit has ever found patentable under section 101.

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term "manufacture" refers to "the production of articles for use from raw or prepared materials by giving to these materials new forms, qualities, properties, or combinations, whether by hand-labor or by machinery." *Diamond v. Chakrabarty*, 447 U.S. 303, 308 (1980) (quoting *American Fruit Growers, Inc. v. Brogdex Co.*, 283 U.S. 1, 11 (1931)). A "composition of matter" by its own terms requires matter. *Chakrabarty*, 447 U.S. at 308.

(1)

*Reading the Supreme Court's and Federal Circuit's Precedents Together,  
A Section 101 "Process" Has Always Transformed Subject Matter,  
Whether Tangible or Intangible, Or Has Been a Process  
That Involved The Other Three Statutory Categories*

(a)

*Principles of Law*

The scope of patentable subject matter under section 101 is broad, but not infinitely broad. "Congress included in patentable subject matter *only* those things that qualify as 'any ... process, machine, manufacture, or composition of matter, or any ... improvement thereof....'" *In re Warmerdam*, 33 F.3d 1354, 1358 (Fed. Cir. 1994) (quoting 35 U.S.C. § 101) (emphasis added). Thus, "[d]espite the oft-quoted statement in the legislative history of the 1952 Patent Act that Congress intended that statutory subject matter 'include anything under the sun that is made by man,' [citation omitted], Congress did not so mandate." *Id.*

In the case where a claim is for a process, as opposed to a product, "[t]he line between a patentable 'process' and an unpatentable 'principle' is not always clear. Both are 'conception[s] of the mind, seen only by [their] effects when being executed or performed.'" *Parker v. Flook*, 437 U.S. 584, 589 (1978) (quoting *Tilghman v. Proctor*, 102 U.S. 707, 728 (1880)). "The holding that the discovery of [Benson's] method could not be patented as a 'process' forecloses a purely literal reading of § 101." *Flook*, 437 U.S. at 589. "[W]hen a claim containing [an abstract idea] implements or applies that [idea] in a structure or process which, when considered as a whole, is performing a function which the patent laws were designed to protect (*e.g.*,

transforming or reducing an article to a different state or thing), then the claim satisfies the requirements of § 101.” *Diamond v. Diehr*, 450 U.S. 175, 192 (1981); *see also Gottschalk v. Benson*, 409 U.S. 64, 70 (1972) (“Transformation and reduction of an article ‘to a different state or thing’ is the clue to the patentability of a process claim that does not include particular machines.”).<sup>2</sup>

The Supreme Court, however, presumably concerned about barring patents for future, unforeseeable technologies, declined to rule on whether its precedent foreclosed any other possible avenues for a method claim to qualify as a section 101 process: “It is argued that a process patent must either be tied to a particular machine or apparatus or must operate to change articles or materials to a ‘different state or thing.’ We do not hold that no process patent could ever qualify if it did not meet the requirements of our prior precedents.” *Benson*, 409 U.S. at 71. Rather than rule on this question in *Benson* and *Flook*, the Supreme Court decided those cases based on the abstract idea exception to patentability. *Benson*, 409 U.S. at 71-72; *Flook*, 437 U.S. at 594-95.

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<sup>2</sup> The principal exception to this rule, as explained *infra*, is when the machine-implemented method merely manipulates abstractions. *See Benson*, 409 U.S. at 71-72. In addition, merely attaching a machine to an otherwise ineligible method may not be sufficient and would depend on how the machine actually implemented the recited steps. For example, if a nonstatutory claim were amended so that a recited step of registering a customer was performed by entering data into a computer rather than using a sign-up sheet, it is hard to imagine how that alone would satisfy the requirements of § 101 and convert an otherwise ineligible claim into an eligible one.

Since *Diehr*, the Federal Circuit has reviewed several computer technology cases, and in acknowledgment of the innovations occurring in this technological field, identified a third category of method claims that qualify as a “process.” Extrapolating from the Supreme Court’s “transformation and reduction of an article” test, the Federal Circuit has held that transformation of intangible subject matter (*i.e.*, data or signals) may also qualify as a § 101 process. See, *e.g.*, *State St. Bank & Trust Co. v. Signature Fin. Group, Inc.*, 149 F.3d 1368, 1373 (Fed. Cir. 1998). Responding to the argument that process claims must recite a “physical transformation,” the Federal Circuit in *AT&T* ruled that “physical transformation” “is not an invariable requirement, but merely one example of how a mathematical algorithm may bring about a useful application.” *AT&T Corp. v. Excel Communications, Inc.*, 172 F.3d 1352, 1358 (Fed. Cir. 1999). Quoting the Supreme Court’s language, “*e.g.*, transforming or reducing an article to a different state or thing” from *Diehr*, the *AT&T* court noted the usage of “*e.g.*” “denotes an example, not an exclusive requirement.” *Id.* at 1359. *AT&T* went on to cite the transformation of intangible data signals in the method claim of *Arrhythmia Research Technology Inc. v. Corazonix Corp.*, 958 F.2d 1053, 1059 (Fed. Cir. 1992), as an example that qualifies as a § 101 “process” in addition to the Supreme Court’s test. See *id.* at 1359.

Accordingly, the Federal Circuit has consistently used its own “data transformation” test in assessing the eligibility of various machine-implemented claims. In *Alappat*, the court held that “data, transformed by a machine” “to produce a smooth waveform display” “constituted a practical



application of an abstract idea.” *State Street*, 149 F.3d at 1373. Specifically, the court in *Alappat* stated that the claimed invention as a whole was directed to a machine for “converting discrete waveform data samples into anti-aliased pixel illumination intensity data to be displayed on a display means.” 33 F.3d 1526, 1544 (Fed. Cir. 1994) (en banc). In *Arrhythmia*, the court held “the transformation of electrocardiograph signals” “by a machine” “constituted a practical application of an abstract idea.” *State Street*, 149 F.3d at 1373. Specifically, the court in *Arrhythmia* stated “the number obtained is not a mathematical abstraction; it is a measure in microvolts of a specified heart activity, an indicator of the risk of ventricular tachycardia.” 958 F.2d at 1062. Likewise, in *State Street*, the court held that “the transformation of data” “by a machine” “into a final share price, constitutes a practical application of a mathematical algorithm” because “a final share price [is] momentarily fixed for recording and reporting purposes and even accepted and relied upon by regulatory authorities and in subsequent trades.” 149 F.3d at 1373. Thus, while *Diehr* involved the transformation of a tangible object – curing synthetic rubber – Federal Circuit also regards the transformation of intangible subject matter to similarly be eligible, so long as data or signals represent some real world activity.

In *Comiskey*, the Federal Circuit held that “[t]he prohibition against the patenting of abstract ideas has two distinct (though related) aspects.” *In re Comiskey*, 499 F.3d 1365, 1376 (Fed. Cir. 2007). The court went on to state:

First, when an abstract concept has no claimed practical application, it is not patentable.

*Id.*; and

Second, the abstract concept may have a practical application. The Supreme Court has reviewed process patents reciting algorithms or abstract concepts in claims directed to industrial processes. In that context, the Supreme Court has held that a claim reciting an algorithm or abstract idea can state statutory subject matter only if, as employed in the process, it is embodied in, operates on, transforms, or otherwise involves another class of statutory subject matter, i.e., a machine, manufacture, or composition of matter. 35 U.S.C. § 101. As the PTO notes, “[t]he Supreme Court has recognized only two instances in which such a method may qualify as a section 101 process: when the process ‘either [1] was tied to a particular apparatus’ or [2] operated to change materials to a ‘different state or thing.’ ” (citations omitted).

*Id.*

(b)

*Claims 1-5 and 12-20*

Like the method claims in *Comiskey*, Appellant’s claims are unpatentable under section 101. The claims are similar to those methods rejected in *Comiskey*, while distinguishable from *Arrhythmia*, *Alappat*, *State Street*, and *AT&T*. The claims do not transform any article to a different state or thing. The determination produced by the claims<sup>3</sup>, while perhaps “useful” in one sense, is simply not the product of any transformation as understood in the case law. Further, the claims do not recite a process that employs the other statutory categories. Accordingly, the claims fail to meet any of the conditions set forth in the case law of either the Supreme Court or Federal Circuit.

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<sup>3</sup> “[D]etermining whether a solution . . . is optimal, feasible, or infeasible” as recited in claim 1, and “determining the solution to the scheduling problem is optimal, feasible, or infeasible” as recited in claim 12.

(2)  
*The “Abstract Idea” Exception*

(a)  
*Principles Of Law*

The Supreme Court has held that “[e]xcluded from such patent protection are laws of nature, natural phenomena, and abstract ideas.” *Diehr*, 450 U.S. at 185. “An idea of itself is not patentable.” *Diehr*, 450 U.S. at 185 (quoting *Rubber-Tip Pencil Co. v. Howard*, 20 Wall. 498, 507, 22 L.Ed. 410 (1874); *Benson*, 409 U.S. at 67 (“[M]ental processes, and abstract intellectual concepts are not patentable.”); *see also id.* at 71 (“It is conceded that one may not patent an idea.”)). In contrast, “[i]t is now commonplace that an *application* of a law of nature or mathematical formula [or abstract idea] to a known structure or process may well be deserving of patent protection.” *Diehr*, 450 U.S. at 187 (emphasis in original).

Clever claim drafting cannot circumvent these principles. That is, even when a claim appears to apply an idea or concept as part of a seemingly patentable process, one must ensure that it does not in reality seek patent protection for that idea in the abstract. *Diehr*, 450 U.S. at 191. Similarly, one cannot patent a process that comprises “every substantial practical application” of an abstract idea, because such a patent “in practical effect would be a patent on the [abstract idea] itself.” *Benson*, 409 U.S. at 71-72.<sup>4</sup>

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<sup>4</sup> The observation in *State Street* that “[w]hether the patent’s claims are too broad to be patentable is not to be judged under § 101, but rather under §§ 102, 103, and 112” did not, nor could it, overrule the Supreme Court’s pre-emption doctrine. *See State Street*, 149 F.3d at 1377. Rather, pre-

Such limitations on process patents are important because without them, “a competent draftsman [could] evade the recognized limitations on the type of subject matter eligible for patent protection.” *Diehr*, 450 U.S. at 192.

It is true that process claims are not necessarily required to recite the means or structure for performing the claimed steps. *See, e.g., AT&T*, 172 F.3d at 1359. But process claims that do not require any machine implementation, and are thus intrinsically more abstract than product claims or method claims reciting structure, will often need to recite some sort of transformation act in order to clearly show that the method claim is for some specific application of the idea and represents something more than just a concept. *See, e.g., id.* at 1358 (noting that “AT&T’s claimed process” uses “switching and recording mechanisms to create a signal useful for billing purposes.”).

(b)  
*Claims 1-5 and 12-20*

We discuss claim 1 as exemplary. Because Appellant’s claim 1 is completely untethered from any sort of structure or physical step, it is directed to a disembodied concept. In other words, claim 1 is nothing but a disembodied abstract idea until it is instantiated in some physical way so as to be limited to a practical application of the idea. For example, the claim does not specify who or what is performing (a) the step of “receiving” the variables, relationships, and constraints, (b) the step of “forming” the set of

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emption was not at issue in *State Street* since the claim in that case was particularly confined to a machine implementation, and did not suffer from the same defect as Appellant’s claim.

non-convex quadratic equations, (c) the step of “solving” the set of non-convex quadratic equations, or (d) the step of “determining” whether a solution is optimal, feasible, or infeasible. Instead, those limitations merely describe steps or goals of the concept. Just as the concept of “receiving” is an abstract idea, so too is the notion of “forming” and the notions of “solving” and “determining.” Accordingly, the claim is so broad that it is directed to the abstract idea itself, rather than a practical implementation of the concept. In addition, the claims are “so abstract and sweeping” that they would “wholly pre-empt” all applications of the notion of solving an operations problem. *See Benson*, 409 U.S. at 68-72; *see also Alappat*, 33 F.3d at 1544 (quoting *Benson*).

Appellant’s claim 1 lacks the “particularly claimed combination of elements” recited in *Alappat*’s claim, the transformation of data by a machine recited in *State Street*’s claim, the transformation of electrical signals in *Arrhythmia*’s method claim, or the transformation of data useful for billing purposes in *AT&T*’s method claim, and therefore lacks those characteristics that separate a practical application of an idea from just the idea itself.

#### B. Medium Claims 6-11

As already noted, Appellant argues that the Examiner erred because the claims recite “a useful, concrete, and tangible result” (App. Br. 10:19).

We disagree. For the same reasons discussed *supra* with respect to claims 1-5 and 12-20, we conclude the medium of claims 6-11 covers (“preempts”) every substantial practical application of the abstract idea. We

conclude that the claim is so broad that it is directed to the “abstract idea” itself, rather than a practical implementation of the concept. Thus, the claimed medium falls outside the scope of § 101.

#### ANALYSIS - 35 U.S.C. § 112, First Paragraph

Appellant argues that the Examiner erred because the claimed invention can be practiced “without undue experimentation” (App. Br. 12:9).

We disagree. Appellant’s conclusion (that undue experimentation is not required) is not supported by argument and is contradicted by Appellant’s statements in his Specification. First, Appellant lists a number of uses of the claimed invention (FF 5 and 10) and goes on to state that the invention has “many other applications” (FF 6) none of which we find in the Specification. Second, Appellant states that the claimed variables are open-ended by stating “variables are things like qualities, quantities, timing, and the like” (FF 12). Third, Appellant similarly states that the claimed constraints are open-ended (FF 13). Fourth, Appellant provides an example set of equations with 3 variables (FF 7) and goes on to state that “[a] typical set of equations has 10,000 variables” (FF 8).

The situation before us is the very definition of “undue” experimentation. We conclude that the facts show that the scope of the claims is far beyond the scope of enablement provided by Appellant’s Specification. Therefore, Appellant has not established that the Examiner erred with respect to this rejection of claims 1-20 under § 112, first paragraph.

ANALYSIS - 35 U.S.C. § 112, Second Paragraph

Appellant argues that the Examiner erred because the Specification states that “the variables may represent qualities, quantities, timing, and the like” and “a person of skill in [the art] would be able to identify the variables that are pertinent to his or her industry” (App. Br. 12:16-19).

We disagree. Appellant’s own argument highlights the problem raised by the Examiner. As pointed out by the Examiner, the limitation “variables” (and “constraints”) is not defined in the claims. Appellant counters by pointing out that the term is defined in the Specification. However, the definition is by way of examples which conclude with the phrase “and the like.” (FF 12,13) This language leaves it to the artisan to determine whether another unnamed item is or is not like the other listed examples without any disclosed “objective standard” upon which to make the determination. Rather, the artisan is left to guess whether an item is included within “the like.” Thus, the outer boundary of Appellant’s claim scope is simply undefined.

The claims fail to comply with the statutory requirement that they particularly point out and distinctly claim the subject matter which the applicant regards as his invention. Appellant has not provided objective standards for the “variables” and “constraints” claim terminology in order to allow the public to determine the scope of the claimed invention.

Therefore, Appellant has not established that the Examiner erred with respect to this rejection of claims 1-20 under § 112, second paragraph.

### ANALYSIS - 35 U.S.C. § 102

We reverse the outstanding rejection under 35 U.S.C. § 102 because the subject matter encompassed by the claims on appeal must be reasonably understood without resort to speculation. Presently, speculation and conjecture must be utilized by us and by the artisan inasmuch as the claims on appeal do not adequately reflect what the disclosed invention is due to the indefinite nature of the claims as set forth *supra*.

### CONCLUSIONS OF LAW

(1) Appellant has failed to establish that the Examiner erred in rejecting claims 1-20 as being unpatentable under 35 U.S.C. § 101.

(2) Appellant has failed to establish that the Examiner erred in rejecting claims 1-20 as being unpatentable under 35 U.S.C. § 112, first paragraph.

(3) Appellant has failed to establish that the Examiner erred in rejecting claims 1-20 as being unpatentable under 35 U.S.C. § 112, second paragraph.

(4) Claims 1-20 are not patentable.



**DECISION**

The Examiner's rejection of claims 1-20 under 35 U.S.C. § 101 is affirmed.

The Examiner's rejection of claims 1-20 under 35 U.S.C. § 112, first paragraph is affirmed.

The Examiner's rejection of claims 1-20 under 35 U.S.C. § 112, second paragraph is affirmed.

The Examiner's rejection of claims 1-20 under 35 U.S.C. § 102(b) is reversed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

**AFFIRMED**

WALKER, *Administrative Patent Judge*, Concurring,

I join the majority in affirming the Examiner's rejections of claims 1-20 under 35 U.S.C. §§ 102(b) and 112, ¶¶ 1 and 2. I also agree that the claimed method of solving an operations problem and machine accessible media capable of directing the machine to perform such method do not qualify as patentable subject matter under 35 U.S.C. § 101, because the appealed claims fall squarely within the abstract idea exception to patentability as described in sections A(2) and B of the Majority Opinion (Majority Op. at 18-21). Because the abstract idea exception is dispositive of the section 101 rejection before us, the Board need not, and I would not, reach the remaining analysis of the Majority in section A (Majority Op. at 11-17).

Moreover, in reaching the conclusion that the appealed method claims "do not qualify as a 'process' under section 101" (Majority Op. at 12), the Majority has extrapolated Supreme Court and Federal Circuit precedent to extend the judicially recognized exceptions to patentable subject matter beyond their foundation. Because any such narrowing of the scope of patentable subject matter is the place of the Legislative branch and not for this Board, I respectfully dissent from that portion of the Majority Opinion.

Congress, not the courts, must define the limits of patentability. Once Congress has spoken, it is "the province and duty of the judicial department to say what the law is." *Diamond v. Chakrabarty*, 447 U.S. 303, 315 (1980) (citing *Marbury v. Madison*, 1 Cranch 137, 177 (1803)). It is the obligation of the courts to take statutes as they find them, guided if ambiguity appears, by the legislative history and statutory purpose. *Id.* With respect to section

101, the Supreme Court has found the statute to be unambiguous and interpreted the statute to “have been cast in broad terms to fulfill the constitutional goal of promoting ‘the progress of Science and the useful Arts’ with all that means for the social and economic benefits envisioned by Jefferson.” *Id.* The definition of patentable subject matter in 35 U.S.C. § 101, necessarily strikes a balance between the interest of the public in free access to intellectual subject matter and the need to promote the progress of Science and the useful arts by permitting access to the patent system. There is an inherent struggle between the desire of the putative patentee in broad patent protection in an ever expanding range of technological areas and the desire by commercial interests for bright line rules that would restrict the issuance of patents in new areas.

Our analysis must be tempered by the recognition that Congress has chosen not to revise the definition of patentable subject matter with the advent of major technological advances, such as computers and biotechnology, and the courts have been left to apply the broad, yet unambiguous, definition contained in § 101. In the absence of a clear pronouncement of Congress that particular methods are not patentable, we should not seek to establish a new bright line rule excluding them in all cases. We instead must apply the existing rubric of exceptions established by the Supreme Court and determine whether one of the accepted exceptions bars patentability of the claims on appeal. As stated above, I believe that the abstract idea exception to patentability applies to both the method and computer accessible media claims in the present appeal. Any attempt by the Majority to create a fourth categorical exception to patentability for

processes neither tied to a machine nor involving transformation thus is not only imprudent but ultimately unnecessary to the disposition of this case.

The Supreme Court has long held that laws of nature, natural phenomena, and abstract ideas are excluded from patent protection. *Diamond v. Diehr*, 450 U.S. 175, 185 (1981). ““An idea of itself is not patentable,”” *id.* (quoting *Rubber-Tip Pencil Co. v. Howard*, 20 Wall. 498, 507 (1874)). ““A principle, in the abstract, is a fundamental truth; an original cause; a motive; these cannot be patented, as no one can claim in either of them an exclusive right.”” *Id.* (quoting *Le Roy v. Tatham*, 14 How. 156, 175 (1853)).

“He who discovers a hitherto unknown phenomenon of nature has no claim to a monopoly of it which the law recognizes. If there is to be invention from such a discovery, it must come from the application of the law of nature to a new and useful end.” *Gottschalk v. Benson*, 409 U.S. 63, 67 (1972) (quoting *Funk Bros. Seed Co. v. Kalo Inoculant Co.*, 333 U.S. 127, 130 (1948)).

The rule that the discovery of a law of nature cannot be patented rests, not on the notion that natural phenomena are not processes, but rather on the more fundamental understanding that they are not the kind of “discoveries” that the statute was enacted to protect. The obligation to determine what type of discovery is sought to be patented must precede the determination of whether that discovery is, in fact, new or obvious.

The underlying notion is that a scientific principle, such as that expressed in respondent's algorithm, reveals a relationship that has always existed.

*Parker v. Flook*, 437 U.S. 584, 593 & n.15 (1978). “Mere recognition of a theretofore existing phenomenon or relationship carries with it no rights to exclude others from its enjoyment. . . . The reason is founded upon the proposition that in granting patent rights, the public must not be deprived of any rights that it theretofore freely enjoyed.” *Id.* (internal quotations omitted).

“It is now commonplace that an *application* of a law of nature or mathematical formula to a known structure or process may well be deserving of a patent.” *Diehr*, 450 U.S. at 187 (citations omitted). In general, a claim drawn to subject matter otherwise statutory does not become nonstatutory simply because it uses a mathematical formula, computer program, or digital computer. *Id.*; *Flook*, 437 U.S. at 590 (“a process is not unpatentable simply because it contains a law of nature or a mathematical algorithm”).

These principles also have been applied to algorithms, or mathematical formulas. The Supreme Court has defined the word “algorithm” in this context as “[a] ‘procedure for solving a given type of mathematical problem,’ and concluded that such an algorithm, or mathematical formula, is like a law of nature, which cannot be the subject of a patent.” *Diehr*, 450 U.S. at 186. On the other hand, when a claim containing a mathematical formula implements or applies that formula in a structure or process which, when considered as a whole, is performing a function which the patent laws were designed to protect (e. g., transforming

or reducing an article to a different state or thing), then the claim satisfies the requirements of § 101. *Id.* at 192.

Applying these concepts, the Court held unpatentable claims for an algorithm used to convert binary code numbers to equivalent pure binary numbers where the sole practical application of the algorithm was in connection with the programming of a general purpose digital computer. *Benson*, 409 U.S. at 71-72. The Court also held unpatentable claims to a method for computing an alarm limit where the application sought to protect a formula for computing this number. *Flook*, 437 U.S. at 596. However, in *Diehr*, the Court found statutory subject matter in “claims describ[ing] a process of curing rubber beginning with the loading of the mold and ending with the opening of the press and the production of a synthetic rubber product that has been perfectly cured” that were not limited to the isolated step of “programming a digital computer.” *Diehr*, 450 U.S. at 193 n.15.

As the Federal Circuit noted in its *en banc* decision in *Allapat*:

A close analysis of *Diehr*, *Flook*, and *Benson* reveals that the Supreme Court never intended to create an overly broad, fourth category of subject matter excluded from § 101. Rather, at the core of the Court's analysis in each of these cases lies an attempt by the Court to explain a rather straightforward concept, namely, that certain types of mathematical subject matter, standing alone, represent nothing more than *abstract ideas* until reduced to some type of practical application, and thus that subject matter is not, in and of itself, entitled to patent protection.

*In re Allappat*, 33 F.3d 1526, 1543 (*en banc*) (1994). The Supreme Court thus has limited the categorical exceptions to patentable subject matter to three: (1) laws of nature; (2) natural phenomena; and (3) abstract ideas.

There thus is a threshold question to be answered: Do the claims on appeal seek patent protection for laws of nature, natural phenomena, or abstract ideas? *Diehr*, 450 U.S. at 191 (“We recognize, of course, that when a claim recites a mathematical formula (or scientific principle or phenomenon of nature), an inquiry must be made into whether the claim is seeking patent protection for that formula in the abstract.”). Because the Majority properly finds in sections A(2) and B that the abstract idea exception applies to all of the claims on appeal, the threshold question is answered in the affirmative, and the analysis should be at an end.

Nevertheless, the majority additionally found that “Appellant’s claims are not the type of method that the Supreme Court or Federal Circuit has ever found patentable under section 101.” (Majority Op. 12). The Majority noted that

The Supreme Court, however, presumably concerned about barring patents for future, unforeseeable technologies, declined to rule on whether its precedent foreclosed any other possible avenues for a method claim to qualify as a section 101 process: “It is argued that a process patent must either be tied to a particular machine or apparatus or must operate to change articles or materials to a ‘different state or thing.’ We do not hold that no process patent could ever qualify if it did not meet the requirements of our prior precedents.” *Benson*, 409 U.S. at 71. Rather than rule on this question in *Benson* and *Flook*, the

Supreme Court decided those cases based on the abstract idea exception to patentability. *Benson*, 409 U.S. at 71-72; *Flook*, 437 U.S. at 594-95.

(Majority Op. at 14). I believe this case, like *Flook* and *Benson*, should be decided based on the abstract idea exception to patentability without creating a per se bar against patenting any method claim that is neither tied to a machine nor involves transformation.

Neither 35 U.S.C. § 101 nor the definition of process in 35 U.S.C. § 100(b)<sup>5</sup> limit statutory processes to industrial processes or those implemented by machines, and I would not create such a distinction. To the extent the majority is seeking to create a fourth category of subject matter excluded from § 101, such an alteration of the statutory mandate is unsupported by precedent and should be avoided. In fact, the Supreme Court has warned against just such a course. *Diehr*, 450 U.S. at 182 (“[I]n dealing with the patent laws, we have more than once cautioned that courts should not read into the patent laws limitations and conditions which the legislature has not expressed.”) (internal quotations omitted).

Moreover, transformation is one way, but not the only way to satisfy the requirement for the claimed invention to be something more than the mathematical algorithm itself. *AT&T Corp. v. Excel Comm., Inc.*, 172 F.3d 1352, 1358-59 (Fed. Cir. 1999) (Physical transformation “is not an invariable requirement, but merely one example of how a mathematical algorithm may bring about a useful application”).

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<sup>5</sup> 35 U.S.C. § 100(b) provides: “The term ‘process’ means process, art, or method, and includes a new use of a known process, machine, manufacture, composition of matter, or material.”



As the Supreme Court itself noted, “when [a claimed invention] is performing a function which the patent laws were designed to protect (*e.g.*, transforming or reducing an article to a different state or thing), then the claim satisfies the requirements of § 101.” . . . The “*e.g.*” signal denotes an example, not an exclusive requirement.

*Id.* at 1358-59 (quoting *Diehr*, 450 U.S. at 192 (emphasis added)). Viewed in light of *AT&T*, the mere fact that our reviewing Court found statutorily eligible claims in *Arrhythmia*, *In re Abele*, 684 F.2d 902 (CCPA 1982), and *In re Taner*, 681 F.2d 787 (CCPA 1982) (where transformation was present) does not support a conclusion that the absence of a transformation is tantamount to the absence of patentable subject matter. *Comiskey* also acknowledges that even a claim reciting an algorithm or abstract idea can state statutory subject matter if it is *embodied in, operates on, transforms, or otherwise involves another class of statutory subject matter*, i.e., a machine, a manufacture, or composition of matter—clearly a broader list than just transformation. *In re Comiskey*, 499 F.3d at 1376.

Without such a legislative mandate to exclude particular processes from patentable subject matter, in particular those that neither are machine implemented nor involve transformation, it is not for this Board to create such a categorical exception. It is entirely appropriate for us to analyze new types of claims to see if they fit within the recognized exceptions to patentable subject matter, but not to expand or contract the legislative mandate. This is particularly true where, as here, the rationale for the existing exceptions—namely that granting patent rights, must not preempt

entirely laws of nature, natural phenomena, or abstract ideas or otherwise deprive the public any rights that it theretofore freely enjoyed—apply. In such a case, creating an additional categorical exception is entirely ill-advised and unnecessary to deciding the case before us.

For the foregoing reasons, I would affirm the Examiner’s rejections of claims 1-20 under 35 U.S.C. §§ 102(b) and 112, ¶¶ 1 and 2 for the reasons stated in the majority opinion and under 35 U.S.C. § 101 as falling within the abstract idea exception to patentability. Because the Majority in sections A and A(1) of its analysis (Majority Op. at 11-17) has extrapolated Supreme Court and Federal Circuit precedent to extend the judicially recognized exceptions to patentable subject matter beyond their foundation, I respectfully dissent from those portions of the Majority Opinion.

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